THE SYLLIDAE (POLYCHAETOUS ANNELIDS) FROM JAPAN -I. EXOGONINAE-

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CITATION:

Imajima, Minoru. THE SYLLIDAE (POLYCHAETOUS ANNELIDS) FROM JAPAN -I. EXOGONINAE-. PUBLICATIONS OF THE SETO MARINE BIOLOGICAL LABORATORY 1966, 13(5): 385-404

ISSUE DATE:

1966-02-25

URL:

http://hdl.handle.net/2433/175416

THE SYLLIDAE (POLYCHAETOUS ANNELIDS) FROM JAPAN

I. EXOGONINAE

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With 1 Map and 5 Text-figures

Abstract

The SYLLIDAE of Japan are named with 77 species and 7 subspecies in 20 genera, 5 subgenera and 4 subfamilies; 2 others in 2 genera are not determined specifically. One new genus, 1 new subgenus, 31 new species or subspecies and 5 new combinations are given. 21 species or subspecies are new to Japanese waters. One genus, *Geminosyllis* is erected from SYLLINAE and one new subgenus, *Regulatus* is named in *Autolytus*. 46 species or subspecies, 53.4%, are currently known only from Japan, 40 others are known also from other areas.

Introduction

Japanese polychaetes have been studied by MARENZELLER (1879–1902), MCINTOSH (1885, 1905), IZUKA (1902–14), MOORE (1903, '07), HESSLE (1917, '25), JOHANSSON (1922, '27), OKADA, Yô K. (1932–37), FAUVEL (1934, '36), OKUDA (1933–50), TAKAHASHI (1934–58) and others. However, little has been known of the Japanese syllids.

MARENZELLER (1879) first reported *Syllis inflata*, newly transferred to *Eusyllis*, from the east coast of Enoshima. In 1906 and 1912 IZUKA reported four species, including two new species, *Amblyosyllis speciosa* IZUKA and *Trypanosyllis misakiensis* IZUKA of which the second goes to *Trypanosyllis* (*Trypanedenta*) *gemmipara* (IMAJIMA and HARTMAN, 1964).

OKADA, Yô K. (1933–34) described three new species from Misaki and Seto; of these *Autolytus purpureimaculata* is here referred to *Myrianida pachycera* that newly transferred to *Myrianida* and *Amblyosyllis nigrolineata* has been referred to *A. speciosa* (IMAJIMA and HARTMAN, 1964).

FAUVEL (1934) reported twelve species from Misaki and Seto. Through the courtesy of the Museum National d'Histoire Naturelle, Paris, and Dr. F. RULLIER these lots were re-examined by me with the result that most of the determinations are believed incorrect.

Publ. Seto Mar. Biol. Lab., XIII (5), 385–404, 1966. (Article 21)

OKUDA (1938) reported from Susaki near Shimoda, Izu Peninsula, four previously named species without diagnosis or description. OKUDA and YAMADA (1954) reported *Typosyllis variegata* from Matsushima Bay, and UTINOMI (1956) newly described *Haplosyllis anthogorgicola* from *Anthogorgia bocki*, a gorgonacean, from Seto.

In the monographic work of IMAJIMA and HARTMAN (1964) 41 species of SYLLIDAE, including 2 new genera, 3 new subgenera, 11 new species, 2 new subspecies and 1 new combination were reported, and 6 were newly added to the Japanese fauna. A few of these are newly combined in this report.

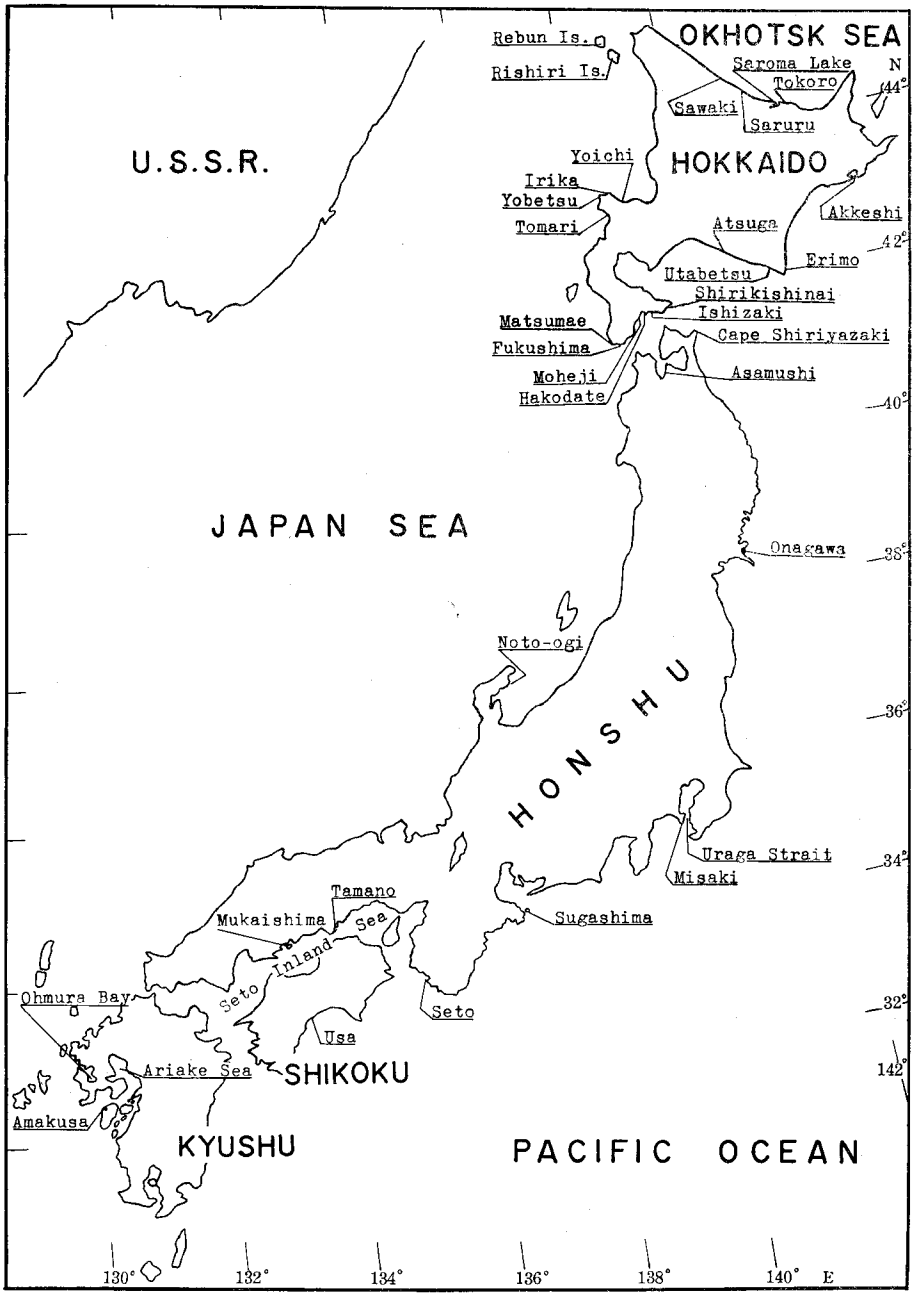
The SYLLIDAE occurring in Japanese coastal areas are here recognized for 84 species or subspecies plus 2 undetermined, in 20 genera and 5 subgenera.

Most of the descriptions of SYLLIDAE are based on collections obtained from intertidal zones, along algal overgrown rocky shores, where Marine Laboratories of Universities have operated. These areas include Akkeshi Bay of the Marine Laboratory of Hokkaido University, Shirikishinai and its vicinity of Hokkaido Gakugei University, Asamushi in Mutsu Bay and Onagawa Bay of Tohoku University, Misaki in Miura Peninsula of University of Tokyo, Sugashima in Shima Peninsula of Nagoya University, Seto in Kii Peninsula of Kyoto University, off Tamano and Mukaishima in the Seto Inland Sea respectively of Okayama and Hiroshima Universities, Usa in Shikoku of Kōchi University, Amakusa in Kyushu of Kyushu University and Noto-ogi of Japan Sea side of Kanazawa University. In addition, material collected from Ariake Sea by the Seikai Fisheries Regional Research Laboratory and from Tokyo Bay by the Fisheries Section, Kanagawa Prefectural Department were studied. These stations and other localities are shown in Map 1.

Holotype specimens described in this paper are deposited in the National Science Museum, Tokyo.

Acknowledgements

The author wishes to express his sincere thanks to Dr. Yô K. OKADA, Director of the National Science Museum of Tokyo for his valuable suggestions and in allowing the use of library facilities. A year of study in 1962, made possible by a grant of the United States National Science Foundation to the Allan Hancock Foundation, of the University of Southern California in Los Angeles, provided a background study of the literature of the polychaetous annelids. The author wishes to thank Dr. Olga HARTMAN of this institution for her advice and critical reading of the present manuscript. Thanks are due to Dr. Tadashige HABE of the National Science Museum of Tokyo and Professor Mayumi YAMADA of the Hokkaido University for their kind help and encouragement during this study. The author is greatly



Map 1. Map of Japan, showing localities mentioned in text.

indebted to the following for loan or use of specimens: to Dr. Marian PETTIBONE, United States National Museum, for cotype of *Syllis spongiphila, Syllis (Ehlersia) cornuta, Eusyllis lamelligera* from Massachusetts, and *Amblyosyllis finmarchica* from Maine; *Autolytus alexandri* from Alaska and Massachusetts; *A. fasciatus* from Massachusetts; *A. cornutus* from Alaska and Maine, and *Syllis alternata, S. harti* and *S. heterochaeta* from British Columbia; to Dr. G. HARTWICH of the Institut für Spezielle Zoologie und Zoologisches Museum of Berlin for *Autolytus pictus* and *A. prolifer* from North Sea; to Dr. P. V. USCHAKOV of the Akademii Nauk SSSR of Leningrad for *Autolytus caterinkae* and *Syllis spongicola* from Kurile Island, *Syllis sclerolaema* and *Eusyllis tubicola* var. *typica* from Okhotsk Sea and *Autolytus beringianus* from Bering Sea; to Mr. J. C. QUENTIN of the Museum National d'Histoire Naturelle, Paris, for permission to examine several Japanese polychaetes identified by FAUVEL (1934), also for *Syllis amica, S. prolifera, S. hyalina, S. exilis, S. cornuta, Autolytus pictus* and *A. prolifer* from France, and for *Syllis armillaris* from Algérie, identified by FAUVEL; to Dr. G. HARTMANN-SCHRÖDER of the Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg, for permission to examine specimens of Australian syllids reported by AUGENER (1913). The author is greatly indebted to the British Museum (Natural History), London for the loan of a syntype specimen of *Syllis cucullata,* from France, and to the Naturhistoriska Riksmuseet, Stockholm, for the loan of the holotype specimen of *Syllis sclerolaema.*

Acknowledgement are also made to Dr. Masuoki HORIKOSHI of the Ocean Research Institute, University of Tokyo and Dr. Wataru IKEMATSU of the Seikai Fisheries Regional Research Laboratory for their permission to use materials from Tokyo Bay and Ariake Sea, and to the staffs of the above mentioned Marine Laboratories of Universities for their valuable contributions to the author's collection. Cordial thanks are extended to Dr. Ryonosuke KITAMORI of the Tokai Fisheries Research Laboratory who generously gave some specimens from Ohmura Bay in Nagasaki Prefecture.

Characteristics of the SYLLIDAE T. WILLIAMS, 1851

Typically the body is short, slender and subcylindrical or flattened and distally tapered. Color in life is generally pale orange or yellowish red, with or without pigmental pattern. The prostomium is distinct, generally semicircular or round; it has four eyes (sometimes with an additional minute anterior pair) in trapezoidal arrangement, and three antennae. A pair of nuchal epaulettes (*Autolytus, Myrianida*) or nuchal lobes (*Amblyosyllis, Autosyllis*) extends from the posterior margin of the prostomium. Two nuchal ridges (*Eusyllis, Odontosyllis*) are present along the posterior margin of the prostomium. Paired palpi are generally subtriangular; they are as long as or longer than

the prostomium but in *Autolytus* may be reduced and ventrally directed. The tentacular segment is achaetous and has one or two pairs of tentacular cirri. The proboscis is eversible and the distal part of the pharynx has a circlet of pharyngeal teeth (trepan) in regular or irregular arrangement (*Autolytus, Myrianida, Trypanosyllis, Geminosyllis, Eusyllis*), or without a trepan but with a middorsal tooth in the inner wall of the pharynx (*Typosyllis, Syllis, Haplosyllis, Opisthosyllis, Exogone, Langerhansia*), or with a row of recurved teeth (*Odontosyllis*).

All segments except the first (=tentacular) segment have uniramous parapodia similar throughout the body ; these may be biramous in sexual forms. Each parapodium is supported by one to several embedded acicula, and carries a fascicle of mostly compound (as in *Autolytus, Amblyosyllis, Typosyllis, Eusyllis, Odontosyllis, Trypanosyllis* (*Trypanedenta*)) or simple (as in *Haplosyllis, Geminosyllis, Trypanosyllis* (*Trypanobia*)) setae; in some posterior segments they may be accompanied by one or two additional simple setae.

Dorsal cirri are smooth (as in *Autolytus, Myrianida, Autosyllis, Odontosyllis, Exogone, Pionosyllis*), or moniliform throughout the length (as in *Typosyllis, Langerhansia, Syllis, Opisthosyllis, Trypanosyllis*) or partly articulated (*Eusyllis*). Ventral cirri are usually digitiform and extend to the setigerous lobe or are shorter; their presence or absence has subfamily rank. Anal cirri are slender, and smooth or moniliform.

The modes of reproduction are extremely varied. Two kinds of reproduction are known: direct and indirect.

A. Direct reproduction: Mature males and females are transformed into reproductive individuals or epitokes in which the whole animal becomes modified. The eyes become enlarged, long swimming setae develop in newly formed notopodia on a number of segments, and the body is filled with sexual products.

(1) Pelagic larvae: Eggs and sperm are shed into the water, and fertilization takes place when the sperms contact the ova after both have been discharged; the embryos develop while floating freely in the sea (*Eusyllis, Odontosyllis* and *Amblyosyllis*).

(2) Gestation: Large yolky eggs produced in the body cavity, pass through the nephridia and are attached ventrally or dorsally to each parapodium, i. e. two eggs to a segment. The egg membrane forms part of the larval cuticle. The larvae do not leave the mother animal until four or five pairs of parapodia as well as eyes, antennae, and a pharynx have been developed (*Exogone*).

B. Indirect reproduction, by asexual stolons: The asexual worm developed from the ovum gives rise to the asexual stolon by budding off from the posterior part of the body a more or less modified sexual individual

known as the sexual stolon. This becomes massed with sexual products. They normally develop long natatory setae, a modified prostomium with eyes, and other appendages. When more or less fully formed this stolon is detached from the stem or stock.

(1) Similar male and female stolons (Chaetosyllis stage): Head appendages poorly developed, with usually two antennae and few small tentacular cirri (*Syllis*).

(2) Sexual dimorphic male (*Polybostrichus* stage) and female (*Sacconereis* stage) stolons: The body is divided into three regions. The three prostomial antennae are conspicuous, very large, frequently thick and coiled. The mouth and pharyngeal structures normally occurring in asexual specimens are lacking. The free-swimming *Sacconereis* specimens are provided with a single, very large egg sack on the ventral side; they contain a large number of larvae (*Autolytus*).

RIOJA (1925) divided the SYLLIDAE T. WILLIAMS into four subfamilies, AUTOLYTINAE, EXOGONINAE, EUSYLLINAE and SYLLINAE.

In the AUTOLYTINAE the body is threadlike, measures 4 to 20 mm long and 0.5 to 1 mm wide; antennae, tentacular cirri and dorsal cirri are not articulated; ventral cirri are absent. The genera *Autolytus* Grube, *Myrianida* MILNE EDWARDS and *Autosyllis* IMAJIMA and HARTMAN are represented in Japan.

In the EXOGONINAE the body is much smaller, slenderer and measures less than 8 mm long and 0.8 mm wide; dorsal cirri are smooth; ventral cirri are present; palpi are fused throughout their length. The genera *Brania* QUATREFAGES, *Exogone* OERSTED and *Sphaerosyllis* CLAPARÈDE are recorded from Japan.

In the EUSYLLINAE the body is more than 10 mm long; dorsal cirri are smooth or somewhat articulated; ventral cirri are present; palpi are fused only at their bases. The genera *Amblyosyllis* GRUBE, *Dioplosyllis* GIDHOLM, *Eusyllis* MALMGREN, *Odontosyllis* CLAPARÈDE, *Syllides* OERSTED and *Pionosyllis* MALMGREN are known from Japan.

In the SYLLINAE the body is large, some species attaining a length of 50 mm. Dorsal cirri are slender and articulated or moniliform; ventral cirri are present; palpi are completely separated from eaeh other or only fused at the bases. It includes the genera *Haplosyllis* LANGERHANS, *Opisthosyllis* LANGERHANS, *Geminosyllis* new genus, *Parasphaerosyllis* MONRO, *Syllis* SAVIGNY, *Trypanosyllis* CLAPARÈDE, *Typosyllis* LANGERHANS and *Langerhansia* CZERNIAVSKY, known from Japan.

Key to subfamilies

1. Without ventral cirri; dorsal cirri smooth.....AUTOLYTINAE
1. With ventral cirri; dorsal cirri smooth or articulated 2

2. Body small, usually less than 8 mm long; dorsal cirri smooth; palpi entirely fused..... ..... EXOGONINAE
2. Body larger, usually more than 10 mm long; dorsal cirri smooth or articulated; palpi fused at bases only or entirely separated 3
3. Dorsal cirri articulated throughout length .....SYLLINAE
3. Dorsal cirri smooth or partly articulated .....EUSYLLINAE

List of Species of SYLLIDAE from Japan

The following 86 species are recorded.

EXOGONINAE

Brania clavata (CLAPARÈDE)
Exogone gemmifera PAGENSTECHER
Exogone verugera (CLAPARÈDE)
Exogone uniformis HARTMAN
Sphaerosyllis erinaceus CLAPARÈDE
Sphaerosyllis hirsuta EHLERS

AUTOLYTINAE

Autolytus (*Autolytus*) *pentadentatus* n. sp.
Autolytus (*Autolytus*) *spinoculatus* n. sp.
Autolytus (*Autolytus*) *irregularis* IMAJIMA and HARTMAN
Autolytus (*Autolytus*) *dentalius* n. sp.
Autolytus (*Autolytus*) *japonensis* IMAJIMA and HARTMAN
Autolytus (*Autolytus*) *tsugarus* n. sp.
Autolytus (*Autolytus*) *magnus* BERKELEY
Autolytus (*Autolytus*) *tamanus* n. sp.
Autolytus (*Regulatus*) *convolutus* COGNETTI
Autolytus (*Regulatus*) *cornutus* AGASSIZ
Autolytus (*Regulatus*) *prismaticus* (FABRICIUS)
Autolytus (*Regulatus*) *okadai* n. sp.
Autolytus (*Regulatus*) *kiiensis* n. sp.
Autolytus (*Regulatus*) *vulgarius* n. sp.
Autolytus (*Regulatus*) *misakiensis* n. sp.
Autolytus (*Regulatus*) *misakiensis longilappetus* n. subsp.
Autolytus (*Regulatus*) *usaensis* n. sp.
Autolytus (*Regulatus*) *setoensis* n. sp.
Autolytus (*Regulatus*) *noroi* IMAJIMA and HARTMAN
Autolytus (*Regulatus*) *nipponensis* IMAJIMA and HARTMAN
Autolytus (*Regulatus*) *nipponensis longicirratus* n. subsp.
Autolytus (*Regulatus*) *mukaishimus* n. sp.
Autolytus (*Regulatus*) *boreatus* n. sp.
Autolytus (*Regulatus*) *alternata* IMAJIMA and HARTMAN
Autolytus species, *Polybostrichus* stage
Myrianida pachycera (AUGENER), n. comb.
Autosyllis japonica IMAJIMA and HARTMAN

EUSYLLINAE

Amblyosyllis speciosa IZUKA
Dioplosyllis japonica (IMAJIMA and HARTMAN), n. comb.
Eusyllis irregulata n. sp.
Eusyllis blomstrandi MALMGREN
Eusyllis longicirrata n. sp.
Eusyllis habei n. sp.
Eusyllis inflata (MARENZELLER), n. comb.
Eusyllis japonica IMAJIMA and HARTMAN
Odontosyllis maculata USCHAKOV
Odontosyllis detecta AUGENER
Odontosyllis setoensis n. sp.
Odontosyllis fulgurans japonica n. subsp.
Odontosyllis undecimdonta IMAJIMA and HARTMAN
Syllides japonicus n. sp.
Pionosyllis uraga n. sp.

SYLLINAE

Haplosyllis anthogorgicola UTINOMI
Haplosyllis spongicola (GRUBE)
Haplosyllis spongicola tentaculata (MARION)
Opisthosyllis viridis LANGERHANS
Opisthosyllis japonica n. sp.
Opisthosyllis longicirrata MONRO
Opisthosyllis brunnea LANGERHANS
Geminosyllis ohma (IMAJIMA and HARTMAN), n. comb.

Trypanosyllis (*Trypanosyllis*) *coeliaca nipponica* IMAJIMA and HARTMAN
Trypanosyllis (*Trypanedenta*) *gemmipara* JOHNSON
Trypanosyllis (*Trypanedenta*) *taeniaformis* (HASWELL)
Trypanosyllis (*Trypanobia*) *depressa* (AUGENER), n. comb.
Trypanosyllis (*Trypanobia*) *asterobia* OKADA
Syllis amica QUATREFAGES
Syllis gracilis GRUBE
Syllis spongiphila VERRILL
Syllis ramosa MCINTOSH
Parasphaerosyllis ezoensis IMAJIMA and HARTMAN
Parasphaerosyllis setoensis n. sp.
Langerhansia cornuta (RATHKE)
Langerhansia rosea (LANGERHANS)
Langerhansia japonica n. sp.
Langerhansia sp.
Typosyllis nipponica n. sp.
Typosyllis okadai (FAUVEL)
Typosyllis hyalina (GRUBE)
Typosyllis alternata (MOORE)
Typosyllis aciculata orientalis IMAJIMA and HARTMAN
Typosyllis fasciata (MALMGREN)
Typosyllis adamanteus kurilensis CHLEBOVITSCH
Typosyllis maculata n. sp.
Typosyllis ehlersioides MARENZELLER
Typosyllis lunaris n. sp.
Typosyllis setoensis n. sp.
Typosyllis monilata n. sp.
Typosyllis regulata n. sp.
Typosyllis variegata (GRUBE)
Typosyllis prolifera (KROHN)

Systematic Account

Subfamily EXOGONINAE RIOJA, 1925

The body is tiny, measures to 8 mm long, linear and threadlike; its surface is smooth or covered with adhesive papillae. Antennae and dorsal cirri are subulate, tapering to slender tips, or clavate to cylindrical. Tentacular cirri number one to two pairs and are similar to antennae and dorsal cirri, or are rudimentary. Palpi are fused for their entire length or for as little as their basal third.

Reproduction is characterized by epigamy and gestation. In epigamy the mature males or females transform into sexual epitokes with swimming setae. In gestation large yolky eggs become attached to the dorsal or ventral surface of the female and develop into advanced nonciliated young.

EXOGONINAE from Japan were previously known for two species, *Exogone verugera* (CLAPARÈDE) (FAUVEL, 1934) from Seto and *Sphaerosyllis hirsuta* EHLERS (IMAJIMA and HARTMAN, 1964) off Cape Shiriyazaki, in 350 m. Four species are newly added: *Brania clavata* (CLAPARÈDE), *Exogone gemmifera* PAGENSTECHER, *Exogone uniformis* HARTMAN and *Sphaerosyllis erinaceus* CLAPARÈDE.

Key to the Genera of EXOGONINAE from Japan

1. Body covered with adhesive papillae, often encrusted with mud; dorsal cirri pyriform ..... *Sphaerosyllis*
1. Body not covered with surface papillae; dorsal cirri not pyriform 2
2. Dorsal cirri long and filiform; with two pairs of tentacular cirri ..... *Brania*
2. Dorsal cirri ovoid; with one pair of tentacular cirri ..... *Exogone*

Brania QUATREFAGES, 1865

Type: *Brania pusilla* (DUJARDIN, 1851)

The body is tiny, threadlike and arched dorsally. The prostomium is wider than long, has two pairs of eyes in trapezoidal arrangement and an additional minute pair of ocular spots. Antennae and dorsal cirri are subulate, thickest basally, tapering to slenderer tips; dorsal cirri are subequal and each as long as the body is wide. Palpi are prominent, and fused for most of their length. The tentacular segment is distinct and has two pairs of tentacular cirri similar to the antennae. Each parapodium is a conical lobe and has a fascicle of compound setae. Ventral cirri are digitiform, extending distally to the tips of the setigerous lobes.

Brania clavata (CLAPARÈDE, 1863)

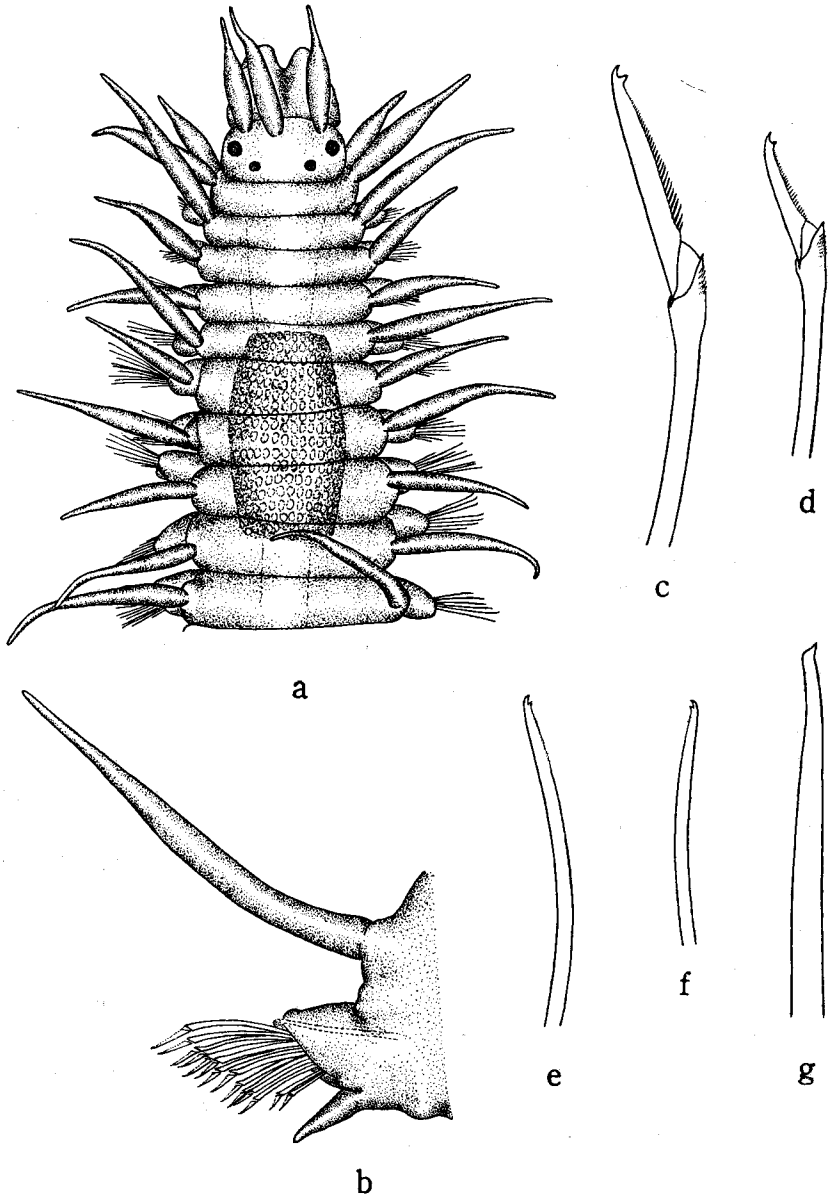
(Text-fig. 1, a-g)

Syllis clavata CLAPARÈDE, 1863, p. 41, pl. 13, fig. 29.
Grubea clavata FAUVEL, 1923, pp. 296-298, fig. 114, a-e; USCHAKOV, 1955, p. 189, fig. 56.
Brania clavata RIOJA, 1943, p. 215, figs. 7-11, 31; HARTMAN, 1944, p. 338, pl. 24, figs. 5-8, pl. 25, fig. 2; USCHAKOV and WU, 1962, pp. 59-60; PETTIBONE, 1963, pp. 133-134, fig. 35b.

Collection: Asamushi; Seto; Noto-ogi, in intertidal zone.

Description: The body is 2.5 to 3 mm long and 0.6 mm wide including parapodia; it consists of 24 to 29 setigerous segments. The dorsum is smooth and pale yellow; it has no color pattern.

The prostomium (fig. a) is subrectangular; its width twice its length, with four large, orange colored eyes in trapezoidal arrangement. All antennae are subequal and distally tapered; they arise from the anterior part of the prostomium. Palpi are about as long as the prostomium; they are fused basally for two-thirds of their length. The pharynx terminates in 10 soft papillae and has a spindlelike, chitinous, subterminal tooth. The proventriculus extends from setiger 4 to 8. The tentacular segment is as long as the following segments and has two pairs of tentacular cirri; dorsal cirri are subequal, each is as long as the median antenna; ventral cirri are slightly longer than half the length of the dorsal ones. Dorsal cirri are slender and taper distally; they alternate between long and short; long ones are as long as the body is wide (fig. b). A normal parapodium is bluntly conical and provided with a fascicle of bidentate compound setae with coarse serrations along the cutting edge. The length of the setal appendage varies with the position of the setae in the fascicle; the superior ones having long appendages (fig. c), the inferiormost appendages are half as long as the superiormost ones



Text-fig. 1. *Brania clavata* (CLAPARÈDE). a, anterior end, in dorsal view, ×95; b, median parapodium, ×190; c, superior compound seta from median parapodium, ×950; d, inferior compound seta from same parapodium, ×950; e, superior simple seta from posterior parapodium, ×950; f, inferior simple seta from same parapodium, ×950; g, aciculum from median parapodium, ×950.

(fig. d). Posterior parapodia have, in addition, two simple setae in the superior and inferior parts of the fascicle; these are distally bifid and minutely serrated along one side (figs. e, f). Ventral cirri are digitate and extend distally beyond the parapodial lobes. Anterior parapodia have pointed acicula; in median and posterior regions each parapodium has only one aciculum (fig. g). The pygidium has two long anal cirri.

Male epitokous specimens have fascicles of swimming capillary setae beginning on the 10th setiger and continuing to the last few segments.

Japanese specimens differ from the original figure (CLAPARÈDE, 1863, pl. 13, fig. 29) in that the median antenna arises from the anterior part of the prostomium, instead of from the posterior part. HARTMAN (1944, pl. 24, fig. 5) illustrates a specimen like that of CLAPARÈDE, whereas her fig. 7 resembles the Japanese specimens more closely.

The species is new to Japan.

Distribution: France; English Channel; Ireland; Mediterranean Sea; Caribbean Sea; Mexico; Massachusetts; Bering Sea; Okhotsk Sea; north Japan Sea; Yellow Sea; Japan.

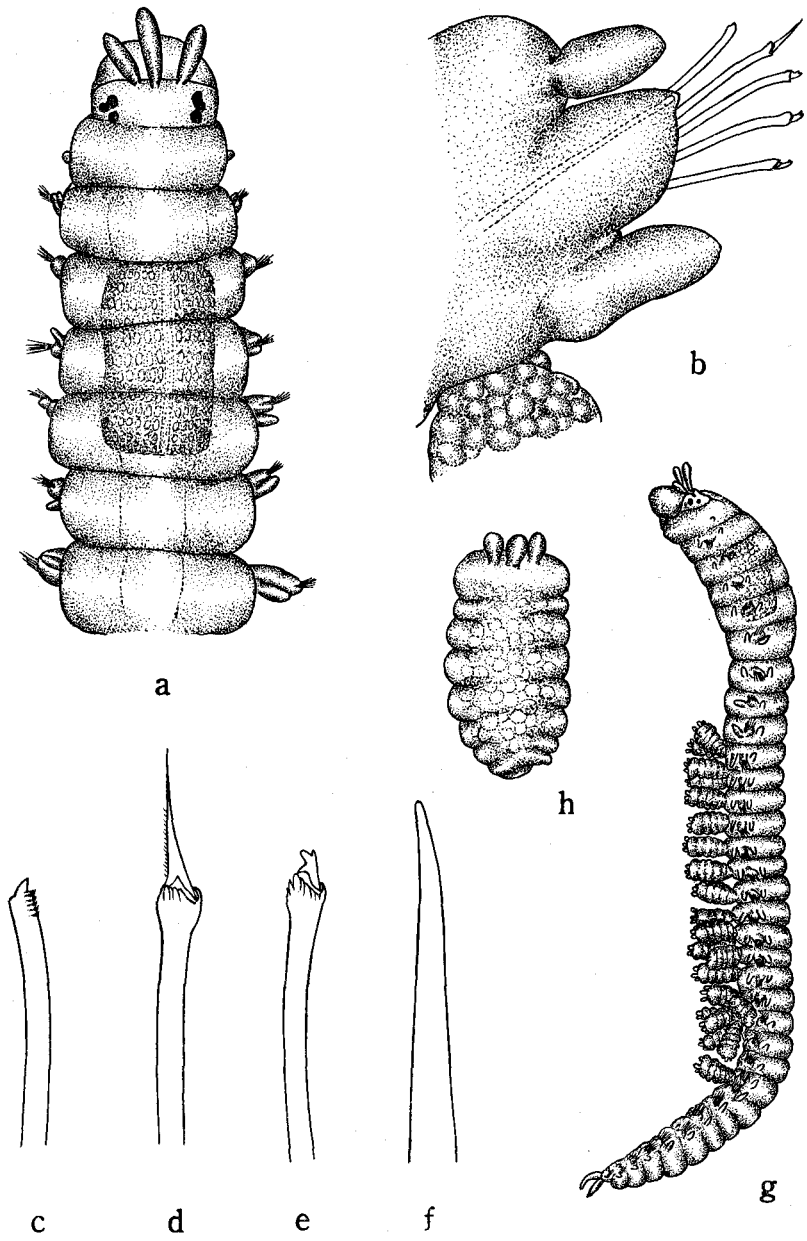
Exogone OERSTED, 1845

Type: *Exogone naidina* OERSTED, 1845

The body is very small, threadlike and arched dorsally. The prostomium is subrectangular, and has two or three pairs of eyes. Palpi are much longer than the prostomium and fused throughout their length. Antennae arise from anterior part of the prostomium and are clavate or ovoid. The tentacular segment is distinct and has a single pair of tentacular cirri, smaller than the dorsal cirri. Dorsal and ventral cirri are shorter than the parapodial lobes. Setae are of four kinds. The pharynx has a single, middorsal tooth. Large eggs, embryos or young are attached on the ventral surface of female, one to two on each of the middle segments.

Key to Species of *Exogone* from Japan

1. Median antenna shorter than prostomium.....*Exogone verugera*
1. Median antenna longer than prostomium.....2
2. Lateral antennae much shorter than median antenna; with dorsal cirri on all parapodia ..... *Exogone uniformis*
2. Lateral antennae not shorter than median antenna; with dorsal cirri on all parapodia except second setiger .....*Exogone gemmifera*



Text-fig. 2. *Exogone gemmifera* PAGENSTECHER. a, anterior end, in dorsal view, ×95; b, median parapodium, showing basal part of embryo on the ventral side, ×295; c, superior simple seta from median parapodium, ×950; d, compound seta with slender, awl-shaped appendage from same parapodium, ×950; e, compound seta with short appendage from same parapodium, ×950; f, aciculum from same parapodium, ×950; g, entire body, in lateral view, with embryos attached on ventral surface, ×35; h, post embryo, ×190.

Exogone gemmifera PAGENSTECHER, 1862

(Text-fig. 2, a–h)

Exogone gemmifera FAUVEL, 1923, pp. 305–306, fig. 117, a–d; BERKELEY and BERKELEY, 1948, pp. 79–80, fig. 118; USCHAKOV, 1955, p. 192, fig. 56, b, g; USCHAKOV and WU, 1962, p. 60.

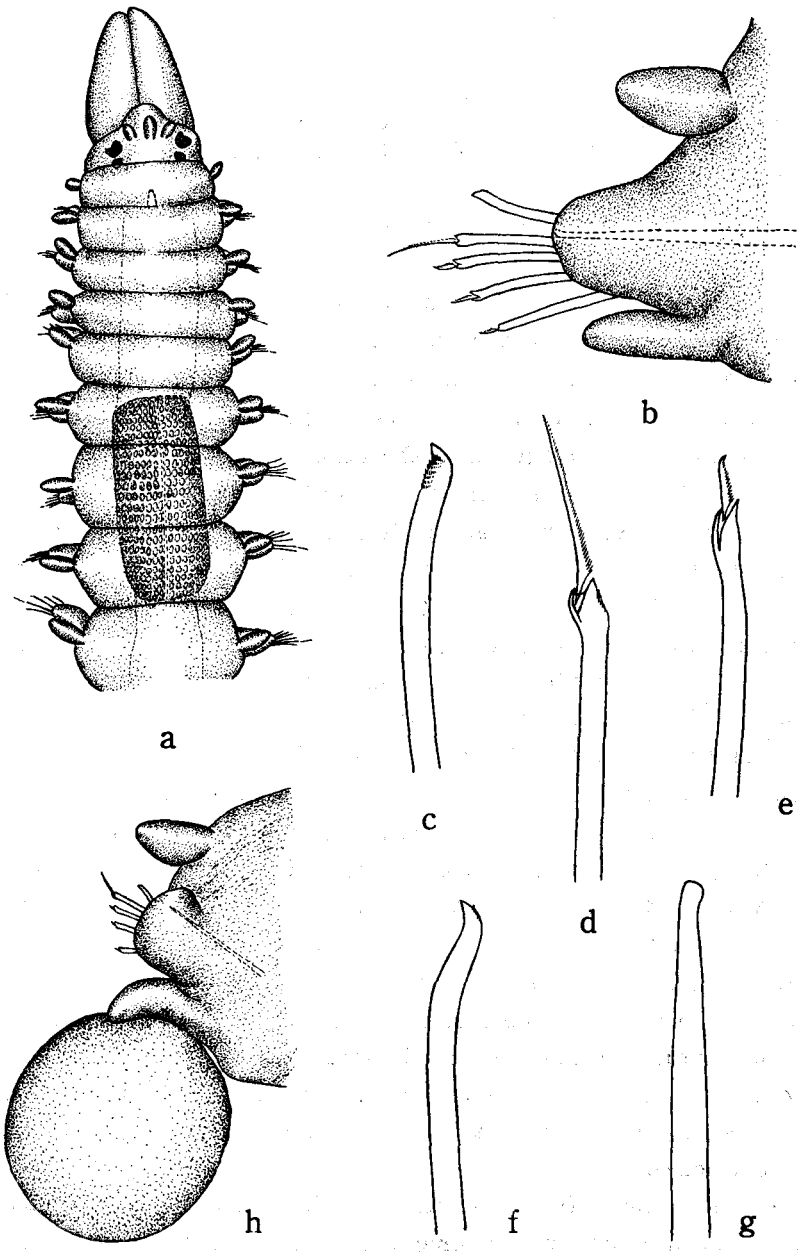
Collection: Funadomari, in Rebun Island, from sandy beach; Asamushi; Mukaishima.

Description: The largest specimen measures 2.8 mm long and 0.5 mm wide; it consists of 33 setigerous segments. The body is yellowish white and has no pigmented pattern; the dorsum is smooth. The prostomium (fig. a) is subrectangular, its width about twice its length. All antennae are clavate; a median one is slightly longer than the others and arises behind the bases of the lateral antennae. There are two pairs of reddish eyes; each of the anterior ones is crescentic and larger than the posterior, which are round. The palpi are oval and fused throughout their length. The first segment is as long as the following segment; each of its tentacular cirri is a short lobe. The proventriculus occurs in segments 3 to 5. A normal parapodium is bluntly conical and provided with a setal fascicle. Dorsal cirri are ovoid; each extends only to the tip of the setigerous lobe (fig. b). The third segment (=second setiger) lacks dorsal cirri (fig. a). Ventral cirri are digitate and larger than the dorsal cirri. A fascicle of setae includes one simple, and two kinds of compound setae. The simple seta (fig. c) appears first in the superior part of the fascicle from the eleventh parapodium. Each has an acute tip and minute serrations in the subdistal part. Each of the one or two compound setae, located in the median part of the fascicle, has a distally slender, awl-shaped appendage (fig. d); each of the more inferior setae has a shorter appendage with a subdistal tooth larger than the distal one (fig. e). Each of the posterior parapodia has one simple seta present in the inferior part of the fascicle; it is similar to, but slenderer than the dorsal one. Acicula (fig. f) occur singly and terminate distally in a blunt tip. The pygidium has two short anal cirri.

The ventral surface of the female, through segments 10 to 25, has three to five embryos in a row to a segment; each embryo consists of seven to eight segments, and has three prostomial antennae (figs. g, h).

The species is new to Japan.

Distribution: France; Atlantic Ocean; Mediterranean Sea; Vancouver Island; Mexico; Bering Sea; Arctic region; north-west of Japan Sea; Okhotsk Sea; Yellow Sea; Japan.



Text-fig. 3. *Exogone verugera* (CLAPARÈDE). a, anterior end, in dorsal view, ×95; b, median parapodium, ×370; c, superior simple seta from median parapodium, ×950; d, compound seta with long awl-shaped appendage from same parapodium, ×950; e, compound seta with short appendage from same parapodium, ×950; f, inferior simple seta from posterior parapodium, ×950; g, aciculum from median parapodium, ×950; h, egg attached on ventral surface of parapodium, ×190.

Exogone verugera (CLAPARÈDE, 1868)

(Text-fig. 3, a–h)

Exogone verugera FAUVEL, 1923, pp. 307–308, fig. 117, m–r; 1934, pp. 312–313; BERKELEY and BERKELEY, 1948, p. 78, fig. 116; USCHAKOV, 1955, p. 191; DAY, 1953, pp. 418–419; PETTIBONE, 1963, pp. 129–130, fig. 31, a–d; IMAJIMA and HARTMAN, 1964, p. 116.
Exogone heterochaeta AUGENER, 1913, pp. 247–249 (not MCINTOSH, 1885).

Collection: Asamushi; Seto; Usa; Noto-ogi, in intertidal zone.

Description: The largest specimen measures 5 mm long and 0.4 mm wide including parapodia; it consists of 40 setigerous segments. The body is yellowish white and its surface is smooth. The prostomium is subpentagonal with rounded front (fig. a). Two pairs of reddish eyes are in trapezoidal arrangement; the anterior ones are larger than the posterior and each is crescentic. The three antennae are short and subequal in size; they are inserted in a straight, transverse line between the anterior eyes. Palpi are well developed and fused throughout their length; they are about twice as long as the prostomium. The pharynx terminates in 10 soft papillae and has a middorsal tooth. The proventriculus occurs in setigerous segments 5, 6 and 7. The tentacular segment is as long as the first setigerous segment; each of the tentacular cirri is similar to the lateral antennae. Dorsal cirri occur as short lobes (fig. b) on every segment. A normal setigerous lobe is distally rounded and provided with a fascicle consisting of one simple seta and two kinds of composite setae. The simple seta (fig. c) appears first from the third to ninth parapodium, in superior position; each has an acute tip with minute serrations on the subdistal part. Each of the one or two compound setae has a long awl-shaped appendage with serrations along the cutting margin (fig. d). The more inferior setae have a shorter appendage with a subdistal tooth larger than the distal one; the cutting margin is minutely serrated (fig. e). Each posterior parapodium has a curved, simple hook in inferior position of the fascicle; the hook has one or two small serrations on the convex margin near the tip (fig. f). Acicula number 3 in the anterior parapodia and diminish posteriorly to one (fig. g).

An epitokous female has a fascicle of the long swimming setae emergent between the dorsal cirri and setigerous lobe, beginning on the 13th parapodium. Some specimens have two eggs on a segment attached to the base of the ventral cirri; the eggs are present on parapodia 13 to 29 (fig. h). The pygidium has two long anal cirri.

The species was first reported from Seto, Japan by FAUVEL (1934).

Some specimens of *Exogone heterochaeta* AUGENER (1913) from Sharks Bay of Australia were re-examined and found to agree.

Distribution: Western and southern Europe; Mediterranean Sea; Massachusetts; Vancouver Island; Mexico; north Japan Sea; Australia; South Africa; Japan.

Exogone uniformis HARTMAN, 1961

(Text-fig. 4, a–j)

Exogone uniformis HARTMAN, 1961, pp. 73–74, pl. 6, fig. 1, pl. 7, figs. 1–4.

Collection: Ohmura Bay, Nagasaki Prefecture, in 10 m.

Description: The largest specimen is 6 mm long and 0.5 mm wide for 55 setigerous segments. The body is linear, has a smooth surface and no color markings. The prostomium is quadrate, wider than long, with 4 small eyes in trapezoidal arrangement (fig. a). The antennae are inserted on a straight line in front of the eyes; the median one is considerably longer than the others and clavate; the lateral ones are short and ovoid. Palpi are large, broad, fused medially and have a slight median notch at the distal forward end. Each of the tentacular cirri is fusiform, similar to the lateral antennae, but a little smaller. The proventriculus is visible through the body in setigerous segment 5 to 8. The dorsal cirri are ovoid, and do not extend beyond the parapodium (fig. b). The ventral cirri are similar to the dorsal ones, but slightly smaller. All parapodia are small, lateral and provided with a setal fascicle. The superiormost seta is simple, distally curved, spinelike, with terminal minute serrations; those in anterior parapodia are slenderer than those in posterior parapodia (figs. c, d). This is followed by one or two spinigerous composite setae with long finely denticulate appendages (fig. e) and by 3 to 4 short bidentate composite falcigerous setae (fig. f). The appendage of composite falcigers is stiffer, with about 5 slender teeth along the cutting margin; its distal tooth is smaller than its subdistal one (fig. f). Posterior parapodia have two kinds of composite setae, slenderer (fig. g) and thicker (fig. h). Their shaft is distally thick and round; those of anterior parapodia have spinous tubercles at the distal part (fig. f). Each of more posterior parapodia has a simple hook in the inferior position of the fascicle (fig. i). Acicula occur singly; each has a blunt tip (fig. j).

Exogone uniformis differs from *E. dispar* (WEBSTER, 1879) and *E. lourei* BERKELEY (1938) in that falcigerous setae have fewer teeth on the cutting margin.

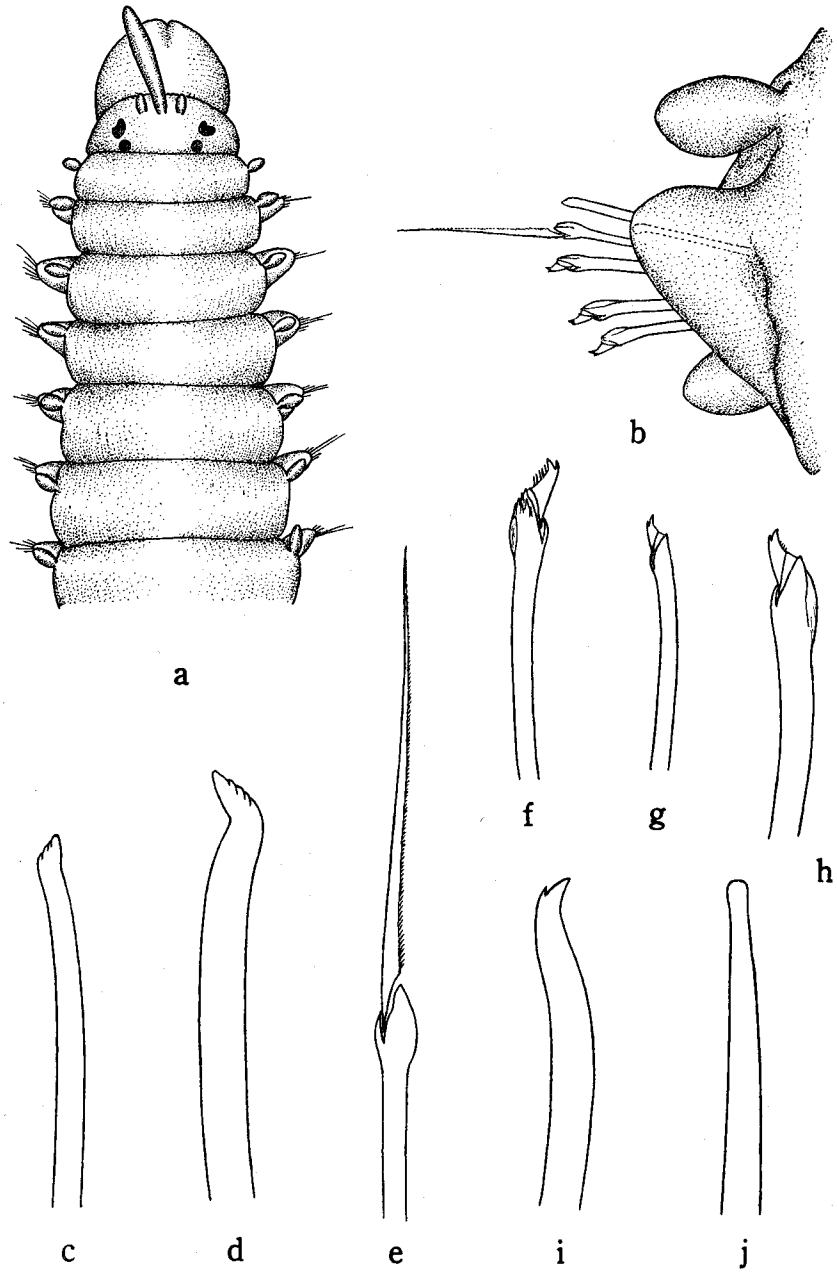
The species is new to Japan.

Distribution: Southern California; southern Japan.

Sphaerosyllis CLAPARÈDE, 1863

Type: *Sphaerosyllis hystrix* CLAPARÈDE, 1863

The body is tiny and threadlike, and the dorsum is smooth or covered with minute papillae. The prostomium has two or three pairs of eyes. The



Text-fig. 4. *Exogone uniformis* HARTMAN. a, anterior end, in dorsal view, ×95; b, median parapodium, in anterior view, ×370; c, superior simple seta from anterior parapodium, ×950; d, superior simple seta from posterior parapodium, ×950; e, spinigerous composite seta from anterior parapodium, ×950; f, falcigerous composite seta from same parapodium, ×950; g, h, falcigerous setae from posterior parapodium, ×950; i, inferior simple seta from same parapodium, ×950; j, aciculum from median parapodium, ×950.

three antennae are similar, bulbous basally, and narrowed distally. Palpi are fused throughout their length. The tentacular segment is not distinctly set off from the prostomium. One pair of tentacular cirri is present and similar to the antennae. The pharynx has a single middorsal tooth. The dorsal cirri are similar to the antennae, but lacking from the second setiger. Setae are of two kinds, simple and composite with hooked tip. The ventral cirri are digitiform and shorter than the setigerous lobes. Reproduction is direct.

Key to Species of *Sphaerosyllis* from Japan

1. Prostomium with three pairs of eyes, two pairs in a transverse line and one pair in front; with early embryos on dorsum .....*Sphaerosyllis erinaceus*
1. Prostomium with two pairs of eyes in trapezoidal arrangement; with early embryos on ventrum .....*Sphaerosyllis hirsuta*

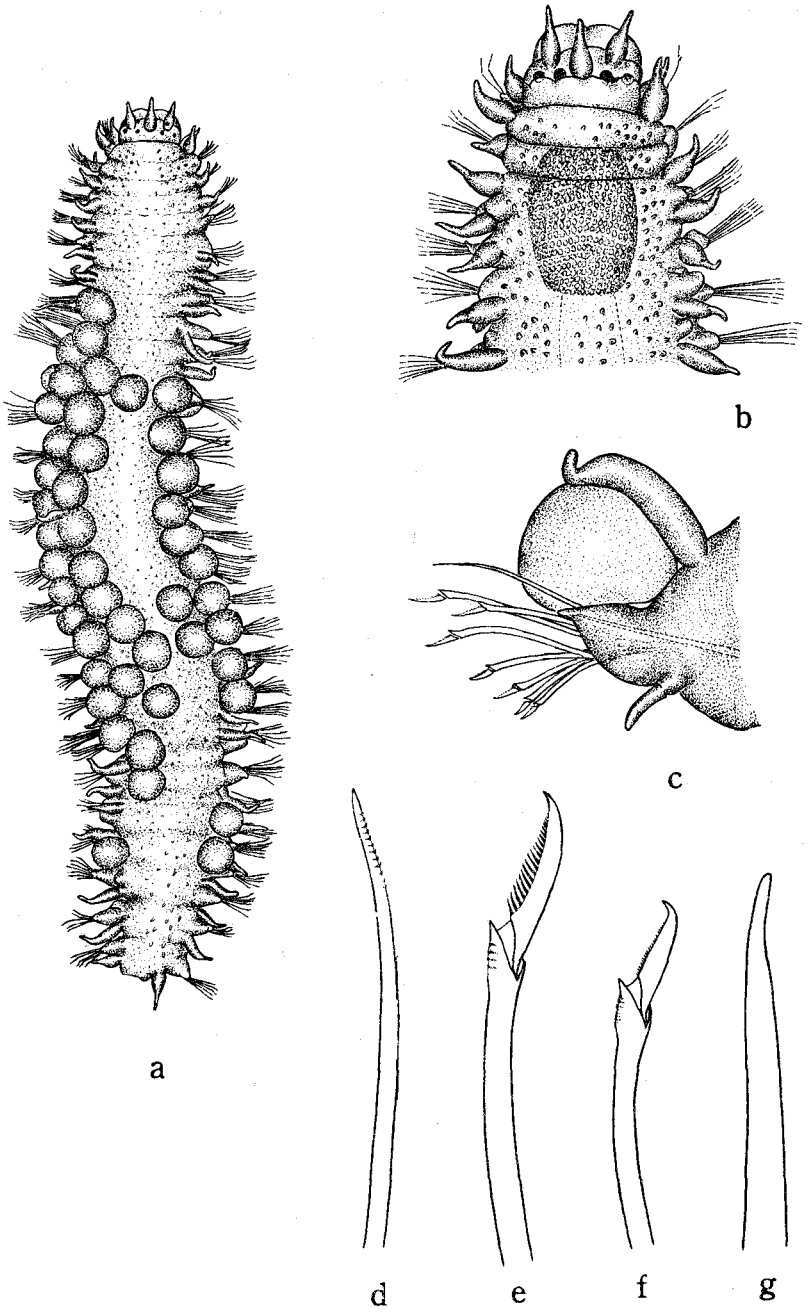
Sphaerosyllis erinaceus CLAPARÈDE, 1863

(Text-fig. 5, a–g)

Sphaerosyllis erinaceus CLAPARÈDE, 1863, pp. 45–46, pl. 13, fig. 38; FAUVEL, 1923, p. 302, fig. 115, g,r; USCHAKOV, 1955, p. 190, fig. 55, b, g; USCHAKOV and WU, 1962, p. 60; PETTIBONE, 1963, pp. 135–136, fig. 35a.

Collection: Funadomari, in Rebun Island, from sandy beach.

Description: A single specimen measures 2.5 mm long and 0.5 mm wide; it consists of 28 setigerous segments. The body (fig. a) is yellowish white and the dorsum is closely covered with small papillae. The prostomium is wider than long. The three pairs of eyes are reddish: a pair of small eyes is near the anterior margin of the prostomium and two pairs of larger ones in one row farther back (fig. b). The three antennae are pyriform, thick at the base and slender distally; they are subequal. The median one arises between the inner eyes and the lateral ones in front of the same eyes. The palpi are about as long as the prostomium and fused throughout their length. The pharynx has a middorsal tooth, and the chitinized distal margin is smooth. The proventriculus occurs in segments 3 to 7. The first segment has a pair of dorsal tentacular cirri, resembling the antennae. The first dorsal cirri are similar to, but larger than, the median antenna. The second dorsal cirri are lacking, and more posterior cirri are slenderer. A normal parapodium is oblique, longest above; its aciculum emerges at its longest end; it has a setal fascicle consisting of one simple, and 7 composite setae (fig. c). The simple seta appears first from the eighth parapodium, in superior part of the fascicle (fig. d). Each seta is distally tapered with minute serrations subdistally. The compound seta has a sharply hooked, unidentate appendage with serrations along the cutting margin. The appendages of the superior setae are longest; the more inferior ones become gradually



Text-fig. 5. *Sphaerosyllis erinaceus* CLAPARÈDE. a, entire body with eggs on the dorsum, in dorsal view, ×55; b, anterior end, in dorsal view, ×95; c, 12th parapodium with an egg, in posterior view, ×190; d, superior simple seta from 12th parapodium, ×950; e, superior compound seta from same parapodium, ×950; f, inferior compound seta from same parapodium, ×950; g, aciculum from same parapodium, ×950.

shorter (figs. e, f). Acicula occur singly; each terminates distally in a blunt tip (fig. g). Ventral cirri are digitate and do not extend distally beyond the parapodial lobes (fig. c). Early embryos are attached on the dorsum or between the dorsal cirri and the setigerous lobes, from segment 9 to 32 (fig. a).

The species is new to Japan.

Distribution: France; Mediterranean Sea; Atlantic Ocean; Massachusetts; north Japan Sea; Bering Sea; Arctic Ocean; White Sea; Yellow Sea; northern Japan.

Sphaerosyllis hirsuta EHLERS, 1897

Sphaerosyllis hirsuta EHLERS, 1897, p. 48, pl. 3, figs. 58–60; USCHAKOV, 1955, p. 190, textfig. 55; CHLEBOVITSCH, 1961, p. 175; IMAJIMA and HARTMAN, 1964, pp. 116–117, pl. 27, figs. f–i.

Collection: Off Cape Shiriyazaki, in 350 m; Notsuka, in Rishiri Island, from *Zostera* bed; Funadomari, in Rebun Island, from sandy beach; Asamushi; Onagawa; Sugashima; Seto; Tamano; Noto-ogi.

Diagnosis: The body is 4 to 8 mm long and 0.6 to 0.8 mm wide including parapodia, for 37 to 44 setigerous segments. The dorsum is covered with many small filiform or conical papillae. All antennae and dorsal cirri are pyriform, thick at the base and slender distally, but more posterior dorsal cirri are proportionately slenderer. The third segment lacks dorsal cirri. The parapodium is bluntly conical and provided with a setal fascicle consisting of one simple and 4 unidentate compound setae with coarse serrations along the cutting margin. Acicula occur singly.

Specimens from Asamushi collected in July have early embryos on the ventral surface, two to a segment from the 11th to 24–28th setigers.

The species was first reported off Cape Shiriyazaki, in 350 m, in Japan; many other specimens were collected from many localities in Japan.

Distribution: Strait of Magellan, southern South America; Kurile Islands; Japan.

(*To be continued.*)